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Trade Settlement Failures in U.S. Bond Markets

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Abstract

In this study, we estimate the total value of trade settlement failures in the US bond markets. Analyzing data from multiple sources, we show that the value of settlement failures is rising. Regulatory and market efforts to reduce the problem have been largely unsuccessful. In April 2008 fails to deliver in bond markets reached a peak value of \$600 billion, a fail rate of nearly 9%. We calculate the resulting loss of tax revenue on payments in lieu of interest (on tax-exempt municipal and Treasury securities) to be \$42 million per year to the federal government and \$271 million per year to the states. We calculate the loss of use of funds to investors as a result of securities paid for but not received to be \$7 billion per year.

About the Author

Dr. Trimbath is a former manager of depository trust and clearing corporations in San Francisco and New York. She is co-author of *Beyond Junk Bonds: Expanding High Yield Markets* (Oxford University Press, 2003), a review of the post-Drexel world of non-investment grade bond markets. Dr. Trimbath is also co-editor of and a contributor to *The Savings and Loan Crisis: Lessons from a Regulatory Failure* (Kluwer Academic Press, 2004)

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The subject of this research is changing every day as new data is released. Any errors in the description of the bond markets or in the statistics used to describe them are the sole responsibility of the author.

INTRODUCTION

At a conference held in New York in October 2006 we expressed concern about settlement failures in US equity markets (Trimbath, 2006a). Our emphasis was on the extent of trade settlement failures, a subject that had begun to receive attention from the Securities and Exchange Commission with the proposal of Regulation SHO in 2003. At the New York meeting, staff members from the Federal Reserve Bank (FRB)¹ who were in attendance described similar concerns about activity in the bond markets. According to data and staff research available from the FRB, settlement failures are prevalent in the market for US Treasury bonds (including bills and notes). Transactions to which the FRB is a party are settled directly with them and not through any other clearing corporation. Trades in Treasury bonds that do not involve the FRB may be settled at a privately run clearing corporation, such as the Depository Trust and Clearing Corporation (DTCC). A subsequent review of FRB data and research reports showed that the actual size of the problem in the bond markets was many times the size of known equity market settlement failures.

Economists at the FRB (Fleming and Garbade, 2002 and 2005) suggest that settlement failures in Treasuries could be the result of operational (paperwork) problems, fluctuating interest rates, changes in supply and demand resulting from quarterly Treasury financing needs, and/or the lack of incentives to deliver sold bonds on time. The FRB economists suggested that “episodes [of high settlement failures] can be traced to market participants’ insufficient incentive to avoid failing.” They suggest that implementing fines for settlement failures could curb the practice, although that suggestion was not implemented.

They would also attribute failures to investment decisions, similar to the “strategic failure” theory put forth by an SEC researcher to explain settlement failures in equity markets. The SEC backed away from the “strategic failure” theory in its March 21, 2008 release (No. 34-57511) on a proposed anti-fraud rule aimed at sellers who misrepresent that they own the securities being sold. Furthermore, the May 2007 “Treasury Market

¹ FRB market operations staffs from both New York and Boston were in attendance.

Best Practices” contain specific language admonishing against “trading strategies that create or exacerbate settlement fails.”² In July 2008, SEC Chairman Christopher Cox acknowledged the abusive nature of settlement failures in US capital markets.³

Although some of these explanations are generally offered by market participants and seem to be accepted by regulators⁴ we determine that they do not hold up to close scrutiny. First, we find that certificates are involved in a minimal number of bond trades and that increased supply (through supplementary offerings and/or lending) does not result in decreased fails. Using a longer series of data than that analyzed by Fleming and Garbade, we do find evidence of a statistical relationship between interest rates and Treasury bond settlement failures although the explanatory power is quite small. Failing to find logical market-based causes for settlement failure in this research, therefore, we conclude that tolerance for settlement failures in US capital markets has resulted in moral hazard behavior among broker dealers that has a negative financial impact on investors (households) and tax revenues.

Reporting for bond market activity is fragmented. No single source provides a complete picture of either trade volume or settlement failures for all types of bonds. Reconciling these multiple datasets requires some interpolation. This paper is an attempt to analyze information from several sources and to estimate the total value of settlement failures in US bond markets.

The paper is organized as follows. We describe the various types of bonds examined in this study and the market activity in those bonds. Next, we describe the importance of the topic and the details of trade settlement operations. We then estimate settlement failures by providing descriptive statistics on the data and describing our methodology. Finally, we present the results of the estimations for settlement failures (including some direct

² Treasury Market Practices Group, 2007.

³ “...in an abusive naked short transaction, the seller doesn't actually borrow the stock, and fails to deliver it to the buyer.” (What the SEC Really Did on Short Selling, *Wall Street Journal*, page A15, July 24, 2008.)

⁴ “There may be many reasons for a fail to deliver. For example, human or mechanical errors or processing delays can result from transferring securities in physical certificate rather than book-entry form, thus causing a failure to deliver on a long sale within the normal three-day settlement period.” Securities and Exchange Commission Release No. 34-54154; File No. S7-12-06.

costs), our conclusions and a brief description of planned additional research on the subject of settlement failures.

BACKGROUND

There are at least 7 types of debt which are publicly traded (see table below). In contrast to stocks (equities) which pay dividends based on earnings, bonds pay a rate of interest which can be fixed at the time of issuance, hence the term “fixed income securities.”⁵ The terms “bonds” and “fixed income securities” are often used interchangeably. For convenience, in this study we will refer to debt instruments in general as “bonds” or “securities.”

The exact size of the market is not accurately known. According to SEC (2004), the amount of municipal bonds outstanding in 2000 was reported as \$2.0 trillion by Standard & Poors⁶, as \$1.6 trillion by the Federal Reserve⁷ and as \$1.5 trillion by the Census Bureau.

Outstanding U.S. Bond Market Debt (\$US billions)

Bond Type	2006	2007
Municipal	2,337.5	2,570.6
Treasury	4,283.8	4,428.4
Mortgage-Related	6,400.4	7,053.4
Corporate	5,209.7	5,702.8
Federal Agency ^a	2,665.2	2,853.2
Money Market	3,818.9	4,141.3
Asset-Backed	2,016.7	2,477.3
Total Bonds	\$26,732.2	\$31,234.0

Source: Securities Industry and Financial Markets Association as of September 30. a: GNMA, FNMA, and FHLMC mortgage-backed securities are reported under “Mortgage-Related.”

⁵ Significant amounts of publicly traded debt pay variable rates of interest. However, the term “fixed income” continues to be applied to these securities.

⁶ KennyBase Database Services

⁷ Flow of Funds Section of the Board of Governors report.

U.S. Bond Market Trades (\$US billions)

Bond Type	2006	2007
Municipal	5,682.0	6,317.1
Treasury	132,474.7	143,486.6
Mortgage-Related	64,407.6	80,997.2
Corporate	3,439.0	3,238.1
Federal Agency	18,817.5	20,994.7
Total Bonds	\$26,732.2	\$31,234.0

Source: Securities Industry and Financial Markets Association

Average Daily Value of Transactions Settled (before netting, \$US billion)*

Entity	2006	2007
NSCC total	\$694	\$1,137
Corp.bonds and UITs		\$20.6**
FICC US Govt. and MBS		
US Govt	\$3.4	\$4.5
Agency MBS	\$301.6	\$376.9

Source: Depository Trust and Clearing Corporation (annual reports)

*Some values estimated based on annual data using 252 settlement days per year. FICC only processes Federal Agency MBS.

** Includes Municipal bonds; 99% of all new municipal bonds were issued as bookentry only through DTC in 2007

The value and quantity of bonds traded and the value and quantity settled are not the same because of the process known as “netting.” In netting trade obligations, FICC uses bonds *due to* a participant to offset bonds *due from* the same participant in the same security.⁸ This process results in cash settlement obligations being substantially less than the total amount traded. This process is believed to benefit the financial markets by simplifying final settlement. For example, of the approximately \$494 billion in trade obligations processed at NSCC on the peak activity day in 2004, only about \$12.5 billion of money actually changed hands. That is, after netting the value “due to” against the value “due from” each Participant in each security, about 3% of the value remained to be exchanged. Netting the cash-leg of settlement reduces the number of cash movements required to one per participant. Data is not made public about the quantity of bonds that change ownership after netting. There are limited benefits from netting for reducing the

⁸ A similar process takes place for money settlement (except that money due to/from participants is netted regardless of which security was traded).

daily number of securities deliveries because there will be one bond movement for every Participant in every security traded.

In 2007, there were \$210 trillion of securities deliveries through the Depository Trust Company's (DTC's) bookentry system (\$179 trillion in 2006). Transactions settled through NSCC represent only one-half of one percent of the total securities deliveries processed as bookentry movements at DTC. DTC bookentry deliveries include deliveries of money market instruments, commercial paper and securities not eligible for netting at NSCC. These deliveries are not necessarily made as the result of securities trades, although they may include securities deliveries used to settle bond trades. Because DTC does not provide guarantees for this activity, any failed delivery is reversed prior to cash settlement.

Until 2007, most US government securities traded on the New York Stock Exchange (NYSE) were settled "ex-clearing" i.e., the parties arranged for manual clearing and settlement. The NYSE changed this arrangement in 2007 so that all bond trades executed there could clear and settle through (a subsidiary of) DTCC. NYSE also received Securities and Exchange Commission (SEC) approval to allow trading of about 6,000 bonds that were not listed on NYSE but that were issued by companies whose stock is listed on NYSE. Currently, the amount of bond trading on the NYSE is minimal compared to the entire market. For example, on January 19, 2007, 299 bonds were traded on the NYSE, with a value of just over \$300,000.⁹ In contrast, the Federal Reserve reported a daily average of \$22 million in corporate bond trades from just 22 dealers in 2006.¹⁰ As of April 1, 2008, there were 3,307 corporate bond issues listed or traded on NYSE, though only 200 bond issues actually had trading activity since April 2007. The NYSE anticipates having 5,000 bonds eligible for trading by the end of 2008.

At the end of 2007, there were \$13.2 billion in unsettled trades on the books of the National Securities Clearing Corporation (NSCC). NSCC is the nation's centralized clearing and settlement organization for trades and a subsidiary of the Depository Trust

⁹ One bond is equivalent to \$1,000 face value. Bond prices are quoted per \$100.

¹⁰ For the nine months from January through September, 2006.

and Clearing Corporation (DTCC). DTCC is also parent to the Fixed Income Clearing Corporation (FICC) which is the nation's centralized clearing organization for trades in Treasury bonds¹¹ and municipal bonds. NSCC "clears and settles all broker-to-broker equity, *corporate and municipal bond* trading in the U.S." Thus some portion of the \$13.2 billion in settlement failures is relevant to bonds.¹² There are 263 Participants (members) at NSCC who subscribe to bond clearing services.¹³ Two-thirds of those members use continuous net settlement services and therefore could potentially contribute to failed trade settlement figures at NSCC.¹⁴ NSCC also clears government agency bond trades executed on the New York Stock Exchange (NYSE). The Government Securities Division (GSD) of the FICC provides clearance and settlement services for transactions in U.S. government bonds, including Treasury securities and Federal Agency securities. Finally, the Mortgage Backed Securities Division of FICC provides separate services for 139 clearing members trading in mortgage-backed bonds. Fails to deliver at FICC are not included in the NSCC fails figure.

NSCC's Participants include the Primary Dealers who have a trading relationship for US Treasury securities with the Federal Reserve Bank of New York (FRB).¹⁵ The Primary Dealers are banks and securities broker-dealers that trade in U.S. Government securities with the Federal Reserve Bank of New York. Although the FRB does not specifically regulate the Primary Dealers they do establish and monitor minimum capital

¹¹ The Federal Reserve Bank of New York provides these services only for trades to which it is a party.

¹² DTCC 2004, p. 16 (print version, emphasis added). Only 12.5% of municipal bond trades are broker-to-broker (SEC 2004).

¹³ These statistics are based on Participant accounts, not corporate entities; some companies have more than one Participant account. Twenty-five Participants use FICC services for only corporate bonds and 89 use municipal bond services only. The remaining 149 Participants use FICC services for both. In addition, there are 1,749 accounts which execute municipal bond trades on their own behalf but use another firm's account for clearing.

¹⁴ The other 84 specify trade-for-trade settlement in bonds.

¹⁵ As of April 3, 2008 there are 20 dealers on the List of the Primary Government Securities Dealers Reporting to the Government Securities Dealers Statistics Unit of the Federal Reserve Bank of New York: BNP Paribas Securities Corp., Banc of America Securities LLC, Barclays Capital Inc., Bear, Stearns & Co., Inc., Cantor Fitzgerald & Co., Citigroup Global Markets Inc., Countrywide Securities Corporation, Credit Suisse Securities (USA) LLC, Daiwa Securities America Inc., Deutsche Bank Securities Inc., Dresdner Kleinwort Wasserstein Securities LLC., Goldman, Sachs & Co., Greenwich Capital Markets, Inc., HSBC Securities (USA) Inc., J. P. Morgan Securities Inc., Lehman Brothers Inc., Merrill Lynch Government Securities Inc., Mizuho Securities USA Inc., Morgan Stanley & Co. Inc., UBS Securities LLC. Nomura Securities International, Inc. withdrew its name from the list of Primary Dealers on November 30, 2007; CIBC World Markets Corp. withdrew on February 8, 2007.

requirements for applicants.¹⁶ These Primary Dealers make voluntary reports to the FRB about their positions and transactions in most types of bonds, including corporate bonds. However, data goes unreported if neither the buyer nor the seller is a Primary Dealer. Bond market settlement failures are reported to the FRB on a cumulative basis using trade date values.¹⁷ That is, on the FRB reports, a settlement failure reported as \$10 billion could be a \$1 billion trade that remained failed for 10 days or a \$10 billion trade that failed for only one day. DTCC generally “re-nets” settlement failures, that is, failures are re-set to zero each morning and only the end of day fails are recorded.¹⁸ Therefore, the settlement failure figures from the FRB are not easily compared to the numbers released by DTCC. As a general convenience, FRB researchers divide total reported weekly fails by 7 to arrive at an average daily settlement failure statistic that is more easily understood and compared to the DTCC data.

It is difficult to determine how much of total bond trading (and therefore total bond settlement failures) are represented by the Primary Dealers. The FRB’s bond activity data includes financing and lending (repurchase agreements and reverse repurchase agreements) but the bond trade data available from other sources does not. Similarly, settlement failures reported to the FRB include restricted bonds (Rule 144A securities) but bond transaction data available from the National Association of Securities Dealers does not.¹⁹ Furthermore, mortgage-backed bonds are included in the Primary Dealer

¹⁶ “According to the New York Fed’s current criteria, bank-related primary dealers must be in compliance with Tier I and Tier II capital standards under the Basel Capital Accord, with at least \$100 million of Tier I capital. Registered broker-dealers must have at least \$50 million in regulatory capital and must not be in violation of the regulatory “warning levels” for capital set by the Securities and Exchange Commission and the Treasury, the two regulatory bodies that oversee non-bank securities trading organizations.” <http://www.newyorkfed.org/aboutthefed/fedpoint/fed02.html> Accessed August 28, 2008.

¹⁷ “Settlement fails are reported on a cumulative basis for each week, including nontrading (sic) days. For example, if a dealer fails to deliver \$50 million of securities to a customer as scheduled on a Thursday, but makes delivery on Friday, one day late, then the dealer reports \$50 million in fails. However, if the delivery is not made until Monday, four days late, then the dealer reports \$200 million in fails (\$50 million 4 days). Fails thus continue to be counted until settlement occurs.” Fleming and Garbade, 2005. In contrast, FICC introduced in 2006 a program for “re-netting” settlement failures. See section below on trade settlement operations.

¹⁸ FICC introduced in 2006 a program for “re-netting” settlement failures. See section below on trade settlement operations for more details.

¹⁹ For example, in September 2006, NASD reported an average daily trading volume of \$14 billion for system-eligible bonds traded by their 2,205 reporting members (including all 22 Primary Dealers). The Primary Dealers, on the other hand, reported a daily average of \$25.1 billion in corporate bond trades for the same month. The difference is attributable to 1) the number of reporting entities which should make the

reports, but are settled separately from NSCC's continuous net settlement system.²⁰ Finally, NSCC settles municipal bond trades and the Primary Dealers do not report activity in those bonds.

Some settlement failures go altogether unreported. According to Fleming and Garbade (2002): "If the dealer's clearing bank and the investor's custodian are the same depository institution, securities are transferred from the seller to the buyer, and funds are transferred from the buyer to the seller, on the books of the common custodian and without either Fedwire or depository activity." Such activity may not be included in *any* reports. These trades, among others, are referred to as "ex-clearing" trades. The Securities Industry and Financial Markets Association (SIFMA) releases quarterly summary balance sheet information for NYSE member firms. According to this report, in the first quarter of 2008, the 196 firms included reported \$140.6 billion as "Payables: Failed to Receive," i.e., securities they did not receive in settlement which are subsequently owed to investors. This is more than triple the \$38.6 billion figure reported in the first quarter of 2007. Furthermore, the NYSE firms reported a fourfold increase in assets as "Receivables: Failed to Deliver," i.e., securities they did not deliver to contra-parties which they subsequently are owed by other broker-dealers (receivable). These fails rose from \$29.3 billion to \$117.5 billion.²¹ The dramatic increase in this settlement failure data is an indication of the urgent need for updating this research project.

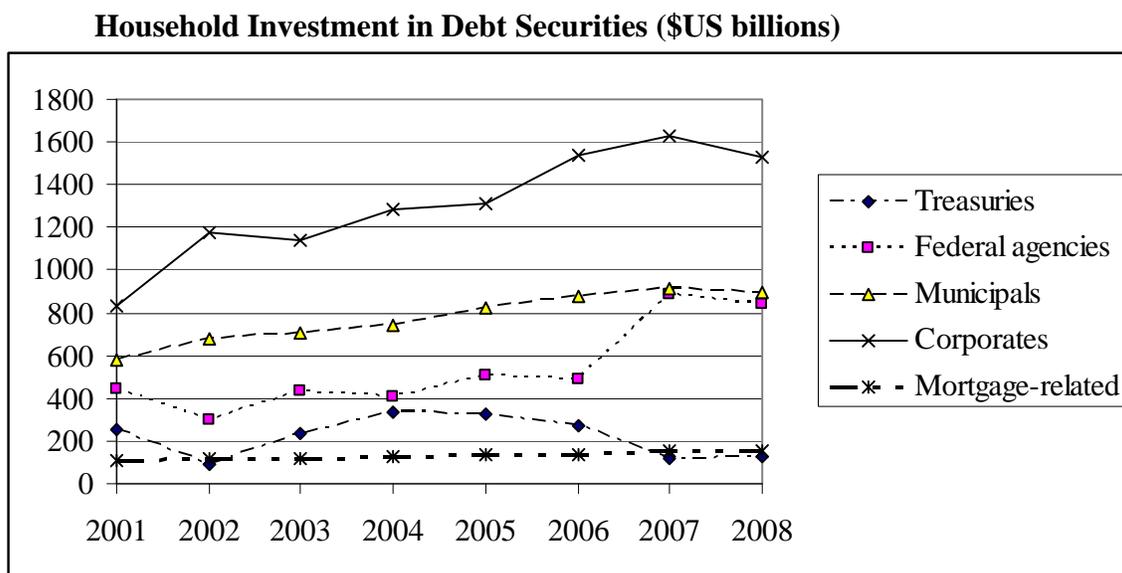
IMPORTANCE OF THE TOPIC

According to Federal Reserve data, nearly three-fourths (73 percent) of the liquid financial assets of American households are invested in securities-related products, such as stocks, bonds, and mutual funds (with the balance in bank deposits and certificates of deposit). Americans had \$3.6 trillion invested in bonds at the end of the first quarter of 2008, up 60% from 2001.

figure higher for the NASD and 2) the number of eligible bonds being reported which would make the figure lower for the NASD.

²⁰ The Mortgage Backed Securities Division of FICC provides net settlement for 228 Participants. No settlement failure (or contingent liability) information is made available in the annual reports.

²¹ An additional \$34.9 billion (\$19 billion in 2007) remained receivable from clearing organizations. This number cannot be reconciled to any figure reported by DTCC.



Source: Federal Reserve System, Board of Governors, Flow of Funds statements.

The problem of “phantom shares” being created by entitlements in investor accounts has been discussed relative to equity securities (explored in Shapiro 2006 and detailed in Trimbath 2006a).²² Likewise, when bond trades fail to settle, “phantom bonds” are created. The investor’s cash account is debited for the value of the bonds purchased and their securities account receives an “entitlement.” When the investors’ broker-dealer fails to receive the bonds for an extended period of time, however, the investor whose account has failed to receive the securities is not notified of the persistent fail. This scenario allows for more bonds to be in circulation than exist (i.e., more than were issued, hence, the term “phantom bond”).

²² The Uniform Commercial Code (UCC) allows broker-dealers to establish these entitlements in order to facilitate book entry securities settlement which is necessary in the central-counterparty system. The use of entitlements was intended to be temporary when securities deliveries could not be made to complete settlement under unforeseen circumstances, such as replacing lost certificates, etc.. “A system of ‘indirect’ holding developed in which DTC maintained ‘jumbo’ certificates representing shares in its possession, and transferred securities by adjustments to participants’ accounts at DTC. Participant banks and broker-dealers in turn provided similar services to their own customers. The 1978 Article 8 could not accommodate this system because it was based on the assumption that investors would own securities directly, either in the form of physical certificates, or as bookentries in the accounts of issuers or transfer agents.” (Boss and Winn, 1997). A complete discussion of the UCC is beyond the scope of this paper. Interested readers may also see Mooney, Rocks and Schwartz (1994).

When trades between broker-dealers fail, the buyer is compensated for the loss of use of funds that occurs between the settlement date and the actual delivery date. Fleming and Garbade (2004) explain it this way:

“Because the buyer does not pay the seller until the seller delivers the securities, the seller loses (and the buyer gains) the time value of the transaction proceeds over the fail interval. This time value can be quantified as the interest that could have been earned on the transaction proceeds in the overnight federal (fed) funds market or in the closely related market for general collateral (GC) repurchase agreements. The prospect of losing the time value of the transaction proceeds provides an incentive for the seller to make delivery on the settlement date or as soon as possible thereafter.”

Individual investors are not included in this reciprocal arrangement. Retail investors are charged the cash portion of their transaction on settlement date regardless of whether or not the seller’s broker delivers securities to the buyer’s broker on that date (Alsin 2006). When bond trade settlement fails, household investors lose the use of their funds between the settlement date and the date when securities are eventually delivered (the close-out date). The investor has paid money for bonds that are literally not in their accounts. In the interim, regardless of the length of time that elapses, the broker-dealer has use of the investors’ funds (without compensation). The broker dealer receives an unjust enrichment by earning overnight use of funds that they don’t share with retail investors. The investors’ earnings are lower than they could be. If the use of funds earnings were not hidden then the broker-dealer would pass along this additional interest to the customer in the form of interest, reduced commissions etc.

Every investor account is vulnerable to losing the use of funds when their broker fails to receive securities at settlement. While the buyer’s broker may enjoy the proceeds of investing the purchase price of the bonds, the individual investor does not. The vast majority of bond trades involve non-dealers. According to SEC (2004), 87.5% of trades in municipal bonds in 2000 involved retail (non-dealer) investors. According to SEC Chairman Christopher Cox, “There’s no part of our capital market more important to

retail investors than the municipal market. Individual investors own two-thirds of the securities.”²³

Further, bondholders have some rights during bankruptcy that shareholders do not (see Wittie 1999). Investors who are holders of “phantom bonds” (entitlement holders) may lose their rights as debt holders when an issuer become insolvent. The peculiarity of bookentry-only bonds (where no certificates are issued other than a master certificate at DTCC) worked against bond holders in the 1994 Orange County bankruptcy proceedings. The County successfully argued that the Uniform Commercial Code (section 8) did not provide protection for the bondholders because the notes were not certificated securities and, even if they were, the bondholders were not “holders” of those securities because the only certificate was registered to DTCC (Wittie, 1999). Under a scenario where failures to deliver result in multiple parties having claims to the same underlying securities, where certificates are not available the retail investor may not be able to press their claim to ownership. This scenario holds for any investor who leaves any security with a broker. In an October 2007 speech, SEC Special Counsel Susan Petersen said, “People with street name positions are entitlement holders, not stockholders.”²⁴ About 99% of all new municipal bonds in 2007 were issued as bookentry-only through DTCC (no certificates available to investors).

State and federal governments also have lower incomes when securities are not delivered for settlement. Interest payments on municipal bonds and Treasury securities receive special treatment for tax purposes. There may be significant tax consequences if the trade remains unsettled over a payment date. The buyers (especially retail investors) will receive payments in lieu of bond interest that will be deducted as if they were actual interest payments. Broker-dealers do not differentiate these payments for tax reporting

²³ Speech by SEC Chairman Christopher Cox: Statement at Open Meeting on Municipal Securities Disclosure, U.S. Securities and Exchange Commission, Washington, D.C. July 30, 2008

²⁴ Speaking at annual conference of Securities Transfer Association, as reported in Association’s January 2008 newsletter.

purposes.²⁵ Failures to deliver in bond trades, therefore, will result in lower tax collections as a result of this misreporting.

In light of the financial market events of September 2008, it is important to note that this question of ownership is different from what may arise in the event of the bankruptcy of the broker-dealer (intermediary). Even though beneficial owners do not have direct rights as bondholders, they do have “rights against their securities intermediaries” (Wittie, 1999). Relevant to settlement failures in bond markets would be the rights of entitlement holders when the seller goes bankrupt after the settlement date but before they deliver the bonds, known as counterparty risk. If the bankrupt broker-dealer does not have sufficient securities to satisfy the positions of all the (retail) investors’, then the investors are entitled to a pro rate share of any cash and securities held by the broker (for investors accounts) and up to \$500,000 from the Securities Investor Protection Corporation (SIPC).

Although resource constraints force us to limit our review to the US, we note that these problems are not limited to domestic bond markets. In a 2004 survey of banks’ and investment firms’ risk management practices, the Bank for International Settlements reported finding a range of practices for tracking unsettled trades among firms in the ten largest countries:²⁶

“Some firms do not track failed trades at all, some firms track all unsettled trades, and some firms track only certain types of trades that fail to settle (e.g. foreign exchange trades or those perceived to have heightened delivery risk. ... [O]ne firm tracks extended settlement trades beyond 45 days in its credit system.” (BIS 2005)

BOND TRADE SETTLEMENT OPERATIONS

In its simplest form, there are 6 steps to any trade. After the investor places an order, the trade is executed. Today, regardless of where and how the trade takes place, on virtually

²⁵ This is the same as the dividend problem addressed by Section 6045(d) of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). JGTRRA, however, applied only to dividend payments on equities.

²⁶ These countries, commonly referred to as the G-10, are Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, Netherlands, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, and United States of America

any exchange or trading platform anywhere in the world, settlement processing begins automatically after the trade. Not all broker-dealers are members of the US central counterparty for trade clearing and settlement, the National Securities Clearing Corporation (NSCC, a subsidiary of DTCC), but they must have a relationship with a member in order to effect settlement there. Both the buyer and the seller must enter the details of the trade separately; if these details match and are confirmed, then the trade has been cleared.

Cleared trades go through a netting process where buys and sells in one security are used to offset each other so that there is only one delivery made at the end of the day for each security. All the cash is also netted, regardless of which and how many securities were traded. In order to make this netting possible, the NSCC inserts itself as the counterparty to every trade. In other words, NSCC becomes the buyer to every seller and the seller to every buyer.

6 Steps to Finish a Trade:

Trades execute. (NYSE or other)

Trades match.

Trades clear. (NSCC)

Trades are netted. (NSCC)

Cash settles. (DTC and FRB)

Securities settle. (DTC)

The Fixed Income Clearing Corporation, a subsidiary of DTCC, provides a range of clearing and settlement services for bond trades. DTCC's annual financial statements include a note on contingent liabilities of FICC. Some bond settlement is passed to NSCC and some settlement services are provided by the Government Securities Division (GSD) of FICC for specific, limited bond types. In this section we provide details on these processes at the primary centralized organizations for bond trade clearing and settlement.

The Fixed Income Clearing Corporation²⁷

The Fixed Income Clearing Corporation (FICC), a subsidiary of DTCC, provides matching for trades in corporate and municipal bonds and Units of Investment Trust (UITs). However, clearance and settlement is provided at NSCC for these trades. FICC's Government Securities Division, on the other hand, offers Net Settlement Services for US Treasury securities.²⁸ Transactions in Treasury bonds normally settle on a next-day basis, although other bonds settle "regular way," i.e., three days after the trade.²⁹ Mortgage Backed Securities (MBS) are processed separately by a division of NSCC.³⁰

According to FRB,³¹ the FICC "is a net settlement organization with a trade comparison facility that limits fails attributable to miscommunication, and a netting and novation facility that limits daisy chain and round robin fails among its members."³² "Novation" is the process whereby a new legal obligation is substituted for an old one; in this case, FICC (or NSCC) steps in as the counterparty to every member's settlement obligation so that DTCC is ultimately responsible for final settlement.³³

Of particular concern for the purpose of this study are the contingent liabilities of FICC which are described this way according to DTCC (2005):

"The GSD's netting system interposes FICC between netting GSD participants for eligible trades that have been netted. The guarantee of net settlement positions by FICC results in potential liability to FICC. Guaranteed positions

²⁷ DTCC is in the process of realigning some of these subsidiaries. However, the operational aspects we describe here were and are valid regardless of corporate structural changes.

²⁸ On a daily basis, FICC provides "centralized, automated clearance and guaranteed settlement for over \$2 trillion in buy/sell and repurchase agreement (Repo) trades" in Treasury bonds. Quote from DTCC website.

²⁹ For more background on settlement in Treasury bonds, see Fleming and Garbade (2002).

³⁰ In 2004, DTCC allowed "FICC's comparison and settlement processes to provide some support for many U.S. Government securities transactions executed by the institutional or 'buy' side." Further to developing services for the buy-side, in 2005 FICC worked toward "providing central counterparty (CCP) capabilities to mortgage-backed securities. ...It will, ultimately, provide members with the ability to compare and net their MBS trades, allocate pools to net settlement obligations and subsequently net and settle pool obligations with FICC as guarantor and contra-side to all activity, as FICC does for the government securities world." DTCC 2004.

³¹ Guide to FR2004 Settlement Fails Data, Federal Reserve Bank of New York.

³² A daisy chain occurs when a seller is "unable to deliver securities because of a failure to receive the same securities in settlement of an unrelated purchase ... A daisy chain becomes a 'round robin' if the last participant in the chain is itself failing to the first participant." (Fleming and Garbade 2002).

³³ The proper functioning of the system [financial markets] depends on the "guarantees of performance made by all the parties in the chain affirming that they will honor their obligations despite a default by another party in the system." See Jackson v. Mishkin (In re Adler, Coleman Clearing Corp.), 263 B.R. 406, 476 n. 47 (S.D.N.Y. 2001).

that have not yet settled are margined and marked-to-market daily. ... At December 31, 2005 the gross amount of guaranteed positions due from netting GSD participants to FICC, which are scheduled to settle on or before January 3, 2006, approximated \$445,415,299,000 and the amount scheduled to settle after January 3, 2006 approximated \$380,772,748,000. There is an equal amount due from FICC to certain other GSD participants after consideration of deliveries pending to FICC....”³⁴

Our interest is determining how much of the \$445 billion may potentially have resulted from settlement failures on earlier dates. Effective September 22, 2006, DTCC established a process to automatically re-net settlement failures for all Government Securities Division members. At that time, DTCC’s records “reflected that the failed obligations versus the GSD were no longer outstanding” because they had all been “resubmitted” for settlement.³⁵ In the Government Securities Division (GSD), failures to deliver will equal failures to receive in every security because GSD does not trade securities for its own account and does not have a program to automatically borrow securities to prevent settlement failures.³⁶ Nearly identical language is used each year in the FICC annual financial statements. A summary of these guaranteed positions “scheduled to settle” for each year is provided in the table below.

³⁴ Note 10 Commitments and Contingent Liabilities in DTCC (2005). This detail appears in the same note to DTCC’s financial statements as the now well-known “\$6 billion in fails” (see Thompson 2005). The language is similar enough to suggest that the FICC figure reveals information about settlement failures in the bond markets.

³⁵ This process was already in place on the equity side where fails are re-netted and marked-to-market daily. Non-CNS transactions are also required to be resubmitted after failing to settle. “The Reconfirmation and Pricing Service (RECAPS) is a mandatory service for all participants that reconfirms and reprices participants’ aged transactions that have failed previously to settle in NSCC’s system or by other means... All equities, corporate bonds, UITs and municipal bonds are eligible for RECAPS.” NSCC’s RECAPS User Guide, February 2007

³⁶ The NSCC Stock Borrow Program which is available for bonds, and the FRB’s Securities Lending program are discussed below.

Fixed Income Clearing Corporation potential Settlement Failures

Year	Due to FICC
2002	\$280,144,014,000
2003	\$386,310,796,000
2004	\$489,288,853,000
2005	\$445,415,299,000
2006	\$505,035,579,000
2007	\$520,766,232,000

Source: annual financial statements of NSCC and FICC.

In 2005, FICC processed \$678 trillion in transactions and made settlement for \$206 trillion, a 70% reduction in cash obligations due to netting. This is substantially less than the overall 97% reduction in cash obligations due to netting that NSCC achieves. Based on 252 business days, the reported daily average transactions are \$2,690 billion with \$807 billion cash settlement. That is, after netting credits against debits for each Participant in each security, about 30% of the value remained to be exchanged. Primary Dealers reported daily average trades of \$184.2 billion in corporate bonds, \$251.6 billion in MBS, and \$78.8 billion in agency bonds for a total of \$514 billion. Therefore, we suggest that Primary Dealers may account for about 20% of FICC activity.

Why settlement fails

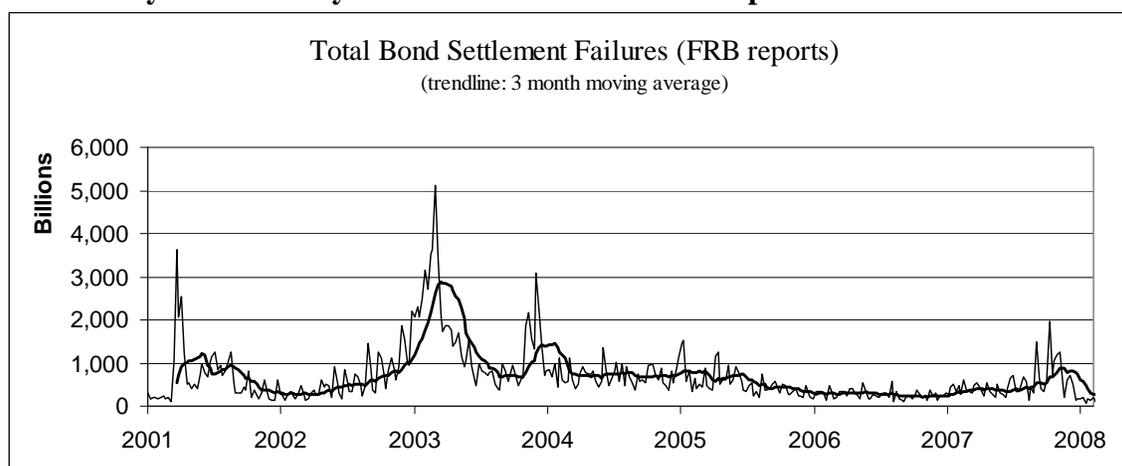
Four reasons are generally offered as to why trades fail to settle on time: operations (paperwork or certificates); lack of securities for lending (to satisfy delivery requirements from short sales); investment strategies (related to interest rates charged for lending or paid by bond financing); and market manipulation including “naked short selling.”³⁷ In this section we discuss each in turn.

Operations: In September of 2001, the FRB noticed an extraordinary number of bond trades that failed to settle. An analysis by two FRB economists, published in 2002 (Fleming and Garbade), suggested that at least part of this was the result of records that were lost or destroyed during the September 11, 2001 attacks on the World Trade Center

³⁷ “Dissecting the Threshold List”, slide presentation by James J. Angel, Ph.D., CFA; Associate Professor of Finance; Georgetown University: 1.) Normal paperwork glitches; 2. Strategic failures; 3. Market failures (lack of lending); 4. Affiliated failures (Hedging of restricted stock, convertibles, PIPEs, etc.); 5. Manipulative selling. See also footnote 4 above.

in Manhattan. After the World Trade Center was destroyed, settlement was postponed for 3 or 4 days while lower Manhattan was closed. FRB settlement failure statistics data are accumulated so that some multiple of average failures would have been expected. The reported total value on September 19, 2001 was \$3.6 trillion.³⁸ Total bond settlement failures reported by the Primary Dealers *surpassed* that figure on August 20, 2003 and nearly matched it again on May 19, 2004 (see chart) without any disruptive event approaching the catastrophe of 2001.³⁹

Primary Dealers Only: Bond Settlement Failures reported to Federal Reserve



Source: Federal Reserve Bank of New York, form FR2400 data.

There is little reason to blame settlement failures on paperwork and certificates for bond transactions.⁴⁰ US Treasury bonds have been virtually all bookentry since the 1980s. Since then, advances have been made toward “dematerializing” (issuing in bookentry only) other bonds types. In 1991, for example, only about 40% of municipal debt was issued exclusively in bookentry form. By 1999 that percentage had climbed to 88%, an indication that the DTCC’s drive to eliminate problems associated with paper certificates continued to make progress more than 20 years after its inception (DTCC 1999, p. 27).

³⁸ This is only for the Primary Dealers who voluntarily submit form FR2400 to the FRB. It includes all settlement failures in US Treasury, Federal Agency, Mortgage-backed, and Corporate bonds.

³⁹ Settlement failures in corporate bonds reached a maximum of \$117 billion on September 19, 2001. They matched their pre-September 11 high on October 3, 2001 (about \$71 billion) and the pre-September 11 low by January 2002 (about \$37 billion). After declining post 9/11/01, the upward trend of failures in corporate bonds peaked in May 2004.

⁴⁰ According to a research study by the Securities Industry Association (SIA), certificates are involved in “just over one-tenth of 1% of all trade transactions processed daily” (cited in DTCC 2004, p. 23).

According to a research study by the Securities Industry Association (SIA), certificates are involved in “just over one-tenth of 1% of all trade transactions processed daily” (DTCC 2004, p. 23).

Lending: The Stock Borrow Program is a service offered by NSCC allow participants to borrow fixed income securities (and stocks) from accounts at DTC “to cover temporary shortfalls in NSCC's Continuous Net Settlement (CNS) System.” Participants notify NSCC of securities available for lending and on the following business day NSCC attempts to match them to securities that other Participants failed to deliver at settlement the previous evening. Information on this borrowing/lending activity is only available at year end (in NSCC’s financial statements). At December 31, 2007 (2006), borrowed securities were used to cover \$1.7 billion (\$1.1 billion) of Participant failures to deliver. DTCC does not release information about the mix of stocks and bonds in this lending.

The FRB provides a temporary source of bonds to cover settlement failures through the Securities Lending program. The program offers securities for loan from the System Open Market Account (SOMA) portfolio. Bond loans are awarded to Primary Dealers based on competitive bidding in an auction held each business day. Loaned securities that are not returned on the maturity date prior to the close of business are extended an additional business day and re-priced at a rate typically equivalent to the prevailing general collateral rate.

In 2008, bonds submitted for lending exceeded the amount need by an average of \$1.5 billion per day compared to an excess of just \$0.4 billion in 2007. There would seem, therefore, to be no shortage of lendable bonds. This is contrary to suggestions presented by Lamont (2006) and others that increasing the supply of securities available for lending will lead to a reduction in settlement failures. Despite virtually doubling lending in Treasury bonds from 2007, trillions of dollars worth of bond trades failed to settle in 2008.

Beyond securities available for lending, the Treasury attempted to increase the overall supply of bonds Post-9/11. They issued an additional \$6 billion of already outstanding 10-year notes “to help resolve an extraordinary volume of settlement fails precipitated by the attacks of September 11” (Fleming and Garbade 2002).⁴¹ Despite the suggestion that “[o]ne way to alleviate chronic fails in an issue is to increase the issue’s outstanding supply,” Fleming and Garbade also noted that fails did not resolve quickly post-9/11. Given that the 2001 settlement failures turned out to have other, as yet undiagnosed, causes than too little supply, the Treasury did not attempt a similar fix in 2003 or 2005.

Investment Strategies: Fleming and Garbade (2002) also attributed the extraordinary increase in settlement failures to investment decisions similar to the “strategic failure” theory later put forth by Boni (2004) to explain settlement failures in the equity markets. In the case of bond market failures, Fleming and Garbade found that interest rates were statistically related to the rate of settlement failures. They reasoned that low interest rates “may have given some market participants an incentive to fail ‘strategically’...” This “strategy” involves a sophisticated scheme of borrowing at current low interest rates in anticipation of later rising interest rates. By failing to deliver bonds on the initial sell order of a repurchase agreement, the broker-dealer can nearly triple their net revenue in two weeks over what they would have earned in the straight execution of the repurchase agreement (Fleming and Garbade, 2002, page 47). Their theory was based on an examination of fails to deliver and interest rates for one year: 2001. We examined a longer series of data for fails to deliver and interest rates: seven years from 2001 to 2008.⁴² Our correlation coefficients for this longer data series show that interest rates have little explanatory power for settlement failures.

Manipulation: In their later study (Fleming and Garbade 2005) the FRB economists offered an additional explanation: the lack of clear incentives to avoid failing, such as the fees and penalties suggested in their earlier report. No penalties were instituted after their

⁴¹ Fortunately, no such cure can be attempted with corporate bonds, where the value outstanding is more tightly controlled as corporate capitalization and where the issuance of new securities would require time-consuming (and often expensive) registration with the Securities and Exchange Commission. Further, municipal bonds require voter or legislative approval for issuance.

⁴² The data is included as Chart A-1 at the end of this paper.

2002 report and settlement failures passed the \$1 trillion mark many times over the following years, including 4 times in 2008.⁴³

One month before our speech in October 2006, former deputy assistant Treasury secretary for federal finance James Clouse addressed the Bond Market Association in New York. Clouse raised allegations of trading abuses in Treasury securities. He said that the Treasury had “observed instances in which firms appeared to gain a significant degree of control over highly sought after Treasury issues and seemed to use that market power to their advantage. In the process, prices in the cash, repo and futures markets appear to have been distorted to varying degrees” (Clouse, 2006).⁴⁴ Clouse acknowledged the role of fails to deliver, an abusive trading practice, in distorting the market for Treasury bonds.

After the initial distribution of our research in February 2007, the securities industry’s Treasury Market Practices Group (TMPG) began publicizing trading guidelines intended to clamp down on abuses in the market for US Treasuries.⁴⁵ The first version of Treasury Market Best Practices was published on May 11, 2007.⁴⁶ The document acknowledges the abusive nature of “strategic fails to deliver”:

“... [A]ll market participants should avoid trading strategies that hinder market clearance. Examples of strategies to avoid include those that cause or exacerbate settlement fails...” (page 1)

In addition, TMPG recommends that automatic triggers be established for review of “elevated delivery or receive fails in a particular security and/or the presence of particular trades that persistently fail to settle” (page 4). In the course of laying out the guidelines, TMPG describes by name several intentionally abusive practices such as “slamming the

⁴³ \$1.5 trillion on January 30, \$2.0 trillion on March 5, \$1.0 trillion on March 19, \$1.2 trillion on March 26, and \$1.3 trillion on April 2.

⁴⁴ His remarks were widely reported in the press until he was replaced as deputy assistant secretary on November 30, 2006.

⁴⁵ “Bond Traders Draft Market Guidelines: Unveiling set for June meeting with New York Fed.” Shane Kite, *Securities Industry News*, May 14, 2007. “A higher-than-normal rate of failure in settling government bond trades can indicate price manipulation...”

⁴⁶ Available on the Treasury Market Practices Group website at www.newyorkfed.org/tmpg. Accessed April 26, 2008.

wire” (holding back deliveries until immediately before the close with the intention of causing settlement fails) and requests from traders for settlement operations to “hold the box” (a demand to delay settlement of an executed trade). The fact that these intentionally abusive practices are colloquially named and described in such detail seems to us to be, in and of itself, an indication that they are common causes of settlement failures.

ESTIMATING TOTAL BOND MARKET SETTLEMENT FAILURES

In the US, many of the organizations we rely on for data about bond trades and settlement failures lack complete transparency. Until 2007, some data from the DTCC was only released through the SEC under Freedom of Information Act requests. They do not release any data on fails to deliver in bonds. Another source of data, the Bond Market Association, is now part of the Securities Industry and Financial Markets Association (SIFMA) which, like DTCC, is controlled by market participants (broker-dealers) who may be responsible for failing to deliver securities for trade settlement.⁴⁷ The bright light among data sources is the FRB. The FRB has been getting reports from a limited number of dealers since 1990. They began making aggregate settlement failure data public in 2004, including statistics dating back to 1999. We use data beginning in July 2001 because that is the point when the FRB data began including corporate bonds.

The FRB is the only source of direct data on settlement failures in bond markets. Their data is limited to voluntary reporting by 22 Primary Dealers (those who trade in US government securities with the FRB). The FR2004 reports collect information on market activity. Specifically, the FR 2004A and FR 2004B reports collect data on transactions; the FR 2004C report includes a section for reporting settlement failures. It includes

⁴⁷ Securities Industry and Financial Markets Association (SIFMA). While DTCC is a self-regulatory organization, SIFMA acts more like a political action group. “SIFMA channels the input from our members into one powerful voice that is heard by elected officials and regulators in Washington, New York and around the world.” Full membership is open only to registered brokers. Source: <http://www.sifma.org/about/join.html> Accessed August 27, 2008.

failures to receive as well as failures to deliver.⁴⁸ The FRB figure is only for trades by and among the Primary Dealers, i.e., it does not include trades to which at least one of them is not a party. The Primary Dealers who voluntarily submit forms FR2400 to the FRB report all settlement failures in US Treasury, Federal Agency, Mortgage-backed, and Corporate bonds.

The trade-date value of bond settlement failures reported by the FRB Primary Dealers at the end of 2007: \$677 billion. From data NSCC makes public, we know the current-market value of some settlement failures by NSCC's 263 Participants at the end of 2007: \$13.4 billion. The FRB-NY's 22 Primary Dealers report only on bond activity.⁴⁹ NSCC does not provide separate failure statistics for equities and bonds.

There are several factors that account for the difference between the NSCC fail data and the FRB fail data. The first is that the NSCC reports current-market value and the FRB-NY data is in trade-date value. If, as is widely suspected, settlement failures put downward pressure on prices by artificially inflating the number of securities available for sale, then one could reasonably expect current market value to be less than trade date value. Second, the NSCC reports a "net" figure while FRB reports gross settlement failures. Therefore, NSCC does not age fails while the FRB data accumulates fails across the number of days that any one failure remains open. The FRB reports 40 times the value of fails that the NSCC does for only one-tenth the number of dealers. FRB makes the data available in a publicly released report weekly. NSCC only releases the year end value in a footnote to the financial statements.⁵⁰

In 2004, DTCC processed \$1.1 quadrillion of securities transactions. Less than 10% of those transactions settled at NSCC.⁵¹ Of the approximately \$402 billion settled at NSCC

⁴⁸ We sometimes use the total of failures to receive and failures to deliver as a statistic comparable to what DTCC reports in annual financial statements. Neither statistic includes securities loaned to prevent failures to receive.

⁴⁹ In addition to the 263 Participants who subscribe to NSCC bond services, there are another 1,740 firms which have correspondent relationships with the subscribing Participants.

⁵⁰ In the last year, the SEC began making daily information available on a two month lag; their data, however, is only for equity securities and only if the number of failed shares exceeds 10,000. Recently they added a field for the current market value per share.

⁵¹ Based on 252 business days per year, that's about \$4.5 trillion per day at DTCC and about \$402 billion per day at NSCC. The remaining \$1 quadrillion of transactions settled would be at other DTCC

on an average day in 2004, about 3% represented matched and compared trades from FICC for corporate and municipal bonds and unit investment trust (UIT) trades. This would put the settlement value at about \$12 billion. By comparison, in 2004, the Primary Dealers reported average daily trades of nearly double that amount (\$21.2 billion) just in corporate bonds.

The most recently available financial statements reported \$255 billion due to and from FICC as of December 2007 (including failed to deliver and failed to receive from earlier settlement days). At the same time, FICC reported \$15.6 billion in the Clearing Fund to secure Participants obligations and satisfy losses and liabilities of the corporation. The figures for 2006 were \$273 billion with a Clearing Fund of \$11.6 billion. According to the FRB the Primary Dealers alone had a daily average of \$189.4 billion in settlement failures outstanding on December 27, 2006 and \$677.4 billion at the end of 2007.

Additional Sources of Data

Trade Reporting and Compliance Engine (TRACE)

TRACE was introduced in July of 2002 by the National Association of Securities Dealers to facilitate the disclosure of bond trade and price data, especially for below investment grade corporate bonds (“junk bonds”) which received less coverage than higher-grade bonds.⁵² TRACE consolidates transaction data for about 27,000 eligible corporate bonds reported by 2,153 reporting firms (NASD 2005). The 50 largest firms account for about 74% of all trade data reported to TRACE.⁵³ TRACE reported about \$16.5 billion in average daily trades in corporate bonds for 2005. Although NASD claims that this “public transaction information on OTC bond activity” represents “over 99 percent of total U.S. corporate bond market activity” the Primary Dealers alone reported average

subsidiaries, like the FICC’s Mortgage Backed Securities Division or institutional transactions processed through the Depository Trust Company. DTCC’s value-processed statistic increased 20-fold in the 5 years from 1999 to 2004.

⁵² See Trimbath (2004) for a discussion of the role of TRACE in price and volume disclosures in corporate bond markets.

⁵³ The top 50 TRACE reporting firms account for about 85% of all customer trades and about 72% of all inter-dealer trades.

daily corporate bond transactions of \$189 billion in 2005, a figure more than 10 times that reported to TRACE.⁵⁴

*Municipal Securities Rulemaking Board (MSRB)*⁵⁵

MSRB provides statistical information on activity patterns in the municipal bond market. The statistics come from trade information submitted by dealers to the MSRB's Transaction Reporting System. According to this source, monthly trading in municipal bonds doubled from \$267 billion in June 2000 to \$538 billion in November 2006.

*Bond Market Association (BMA)*⁵⁶

BMA is the industry association for dealers in the bond markets. They claim to have membership representing “approximately 95% of the U.S. municipal bond underwriting and trading activity,” although our comparison to other sources shows that the activity in their reports is significantly shy of that mark. Now part of the Securities Industry and Financial Markets Association (SIFMA), BMA provides primarily bond price information. Through their companion website (www.investinginbonds.com) they provide information to investors interested in corporate, municipal, mortgage-backed and asset-backed bonds, plus all forms of federal government bonds.

DESCRIPTIVE STATISTICS

Summary Statistics

We use data from July 2001 to current whenever corporate bonds are included in the analysis. Where a longer series can be applied we note that in the description.

⁵⁴ Transactions effected pursuant to Rule 144A are not disseminated by TRACE (NASD Trace Fact Book 2005). However, they are included in data reported to the FRB by the Primary Dealers. Rule 144A bonds are a significant portion of high yield trade volume (TRACE securities) but not the overall market. See Yago and Trimbath (2002) for details on Rule 144A and other high yield bonds.

⁵⁵ “The Municipal Securities Rulemaking Board was established in 1975 by Congress to develop rules regulating securities firms and banks involved in underwriting, trading, and selling municipal securities – bonds and notes issued by states, cities, and counties or their agencies to help finance public projects.” www.msrb.org

⁵⁶ “The Bond Market Association® is the trade association representing the largest securities markets in the world, the estimated \$48 trillion debt markets. As the industry's voice, the Association speaks for the global bond industry, advocating its positions and representing its interests in New York; Washington, D.C.; London; Frankfurt; Brussels and Tokyo; and with issuer and investor groups worldwide.” www.bondmarkets.com

KEY to TABLES:

fail = total settlement failures in bond markets, in \$millions, FRB Primary Dealers data
 ftd = failures to deliver for bond settlements, in \$millions, FRB Primary Dealers data
 ftr = failures to receive for bond settlements, in \$millions, FRB Primary Dealers data
 treas = total settlement failures in Treasury Securities, in \$millions, FRB Primary Dealers data
 loan = securities lending, par accepted, in \$millions, FRB data
 rate = Federal Funds Rate, FRB

Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
fail	692,113	639,886	101,118	5,105,256
ftd	344,012	329,138	45,241	2,618,272
ftr	348,101	311,511	55,877	2,486,984
treas	349,573	471,481	31,877	3,244,008
loan	1,740	1,560	1	7,830
rate	2.90	1.60	0.96	5.30

Correlation Coefficients

	fail	ftd	ftr	loan	rate
ftd	0.9989*				
ftr	0.9987*	0.9952*			
loan	-0.0464	-0.0467	-0.0461		
rate	-0.4568*	-0.4596*	-0.4528*	-0.2554*	
treas	0.9223*	0.9139*	0.9289*	-0.0128	-0.3583*

* statistically significant at 1% level.

The correlation coefficients for interest rates and securities lending are not substantially different across all fails, fails to deliver and fails to receive. We show here that there is no correlation between securities lending and settlement failures in Treasuries. There is a significant correlation between interest rates and securities lending which may have led some researchers to inadvertently find a relationship between failures to deliver and the availability of securities lending by not controlling for the effect of rates on both.⁵⁷ There is a significant relationship between interest rates and failures. Below, we break out the various bond types to determine the source of this connection.

⁵⁷ The correlation coefficient with total fails and the fed funds rate is also about 0.45.

Failure to Deliver in various bonds, correlation with interest rates

	Treas	Agency	MBS	Corp
Agency	0.7339*			
MBS	0.3242*	0.4321*		
Corp	0.0458	0.1077	-0.0508	
Rate	-0.3543*	-0.3751*	-0.4442*	0.2055*

*statistically significant at 1% level.

Here we see that the strongest connection is between mortgage backed securities and interest rates. The weakest connection between failures to deliver and the federal funds rate is with corporate bonds. The correlation coefficient also has the opposite sign: failures to deliver in corporate securities actually move with interest rates. As interest rates rise, the prices of existing bonds (those being traded) will fall. Therefore, it would be logical to fail to deliver bonds sold at today's prices since it will be cheaper to buy bonds later at a lower price and deliver those to satisfy the earlier trade. To fail to deliver bonds on time as interest rates are falling is irrational because replacing the bonds later will be more expensive.

As shown in the graph of settlement failures and the fed funds rate (page A-1 at the end of this paper), there was a long trend of upward movement in interest rates beginning in June 2004. If we limit the time frame before and after June 30, 2004 we see that the correlation of settlement failures (except in corporate bonds) is even stronger after interest rates begin to rise (see table below). This is also the approximate timeframe when the FRB began researching alternative explanations (other than 9/11 disruptions) for settlement failures in the Treasury market. It is possible that the decline in settlement failures resulted from the pressure of immediate regulatory attention and were unrelated to interest rate movements.⁵⁸

Correlation Coefficients

Rate	Treas	Agency	MBS	Corp
Before	-0.3161*	-0.3273*	-0.3035*	0.3512*
After	-0.6169*	-0.6036*	-0.6279*	0.1006

* statistically significant at 1% level

⁵⁸ Although we note that the relationship with corporate bonds was actually weakened, additional research is required to explain that change.

Changes in trading volume do not appear to provide a significant explanation for fails to deliver. If we expand the analysis to 1998-2008 (excluding corporate bonds for which data is not available prior to 2001), then the correlation coefficient for US Treasury fails with US Treasury transactions (reported by Primary Dealers) was 0.259. For mortgage backed securities, the correlation coefficient was only 0.074. This is further evidence that increases in transaction volume have little explanatory power for settlement failures.

METHODOLOGY

FICC reports processing \$2 trillion per day in Treasury securities. By comparison, the Primary Dealers report an average of \$519.48 billion per day in transactions (2006). That would indicate that the Primary Dealers represent about 25% of FICC activity in Treasuries with an average fail rate in Treasury bonds of 3.2%. Extending the fail rate, we would expect to see about \$64 billion worth of Treasury bond settlement failures at FICC. These would be in addition to any other bond or UIT settlement failures for trades passed to NSCC for settlement.

In the week ending December 27, 2006, the Primary Dealers reported daily average bond transactions to FRB of \$698 billion with settlement failures of \$27 billion or 4%. The total reported value of settlement failures for the week was \$189 billion, which counts settlement failures as accumulated over the number of days failed (aged), as explained in the earlier section.

For simplicity, we will use one factor to estimate the total trading activity in the various segments of the bond market when statistics are not available. For this purpose, we choose to use a conservative factor of 4 (i.e., the Primary Dealers represent 25% of bond activity) to estimate the market value of daily settlement failures in bond markets. Likewise, we extrapolate from the Primary Dealer's fail rate to the broader market when necessary, again providing conservative estimates.

RESULTS

Fail rates were substantially higher in the years leading up to the 2004 regulatory activity. The following table presents the average fail rate across all bond types for the period 2001 to 2005 based on transactions and settlement failures reported by the Primary Dealers.

Year	Fail Rate
2001	27.9%
2002	9.3%
2003	22.6%
2004	12.8%
2005	9.3%
Average 2001-03	19.93%
Average 2004-05	11.05%

Although there was improvement in 2006 (4.7% overall fail rate) compared to the initial years after increased regulatory scrutiny (average 11.05% in 2004 to 2005), the data show that settlement failures in US bond markets were on the rise again in 2007 (5.4% fail rate). Preliminary calculations (not shown in tables) based on data for the first 6 months of 2008 show a fail rate of nearly 9%. The tables below show details by bond type for our estimates for settlement failures in 2006 and 2007.

2007 Bonds	Daily Trades	Fail Rate	est. Daily Fails
Municipal	\$ 26.2 billion	5.4%*	\$ 1.42 billion
US Treasury	\$2,293.2 billion	5.3%	\$121.54 billion
GSEs & Agencies	\$1,288.4 billion	4.6%	\$ 59.27 billion
Corporate	\$ 856.6 billion	5.9%	\$ 50.54 billion
Agency MBS	\$ 324.4 billion	5.9%	\$ 19.14 billion
Total	\$4, 788.8 billion	Average 5.4%	\$251.91 billion

*estimated as average of known fail rates in other bond categories.

2006 Bonds	Daily Trades*	Fail Rate	est. Daily Fails
Municipal	\$ 12.2 billion	4.7%**	\$ 0.6 billion
US Treasury	\$1,951.7 billion	3.2%	\$ 62.5 billion
GSEs & Agencies	\$ 297.3 billion	3.0%	\$ 8.9 billion
Corporate	\$ 872.8 billion	3.7%	\$ 32.3 billion
Agency MBS	\$1,103.8 billion	8.9%	\$ 98.2 billion
Total	\$4,236.0 billion	Average 4.7%	\$202.5 billion

* Muni volume was \$10.4 billion in 2000 (SEC 2004) and has been adjusted to 2006 dollars.

**estimated as average of known fail rates in other bond categories.

To put these numbers into perspective, we calculated the value of the settlement failures as a percent of bonds outstanding by category (see table below). In 2004 the SEC passed Regulation SHO with the intention of reducing the number of persistent fails to deliver in certain equity securities. When fails in a security reach the threshold level of 0.5% of securities outstanding, the SEC adopted requirements that sellers

“...take action on all failures to deliver that exist in such securities ten days after the normal settlement date, i.e., 13 consecutive settlement days. Specifically, the participant is required to close out the fail to deliver position by purchasing securities of like kind and quantity.”

The SEC explained the necessity for taking this action:

“We believe this threshold characterizes situations where the ratio of unfulfilled delivery obligations ... represents a significant number of shares relative to the company’s total shares outstanding. We believe that such circumstances warrant action designed to address potential negative effects.”

If the bonds in this study were subject to the SEC’s Regulation SHO, most of them would appear on the Threshold⁵⁹ list for securities for 2006 and 2007.

Threshold level fails in bond markets (\$ billions)

<i>2007 Bonds</i>	<i>Outstanding</i>	<i>Daily Fails</i>	<i>Fails as % of outstanding</i>
Municipal	\$2,570.6	\$ 1.42	0.1%
Treasury	\$4,428.4	\$121.54	2.7%
Federal Agency	\$2,853.2	\$ 59.27	2.1%
Corporate	\$5,702.8	\$ 50.54	0.9%
Mortgage-Related ^a	\$7,053.4	\$ 19.14	n.a.
<i>2006 Bonds</i>	<i>Outstanding</i>	<i>Daily Fails</i>	<i>Fails as % of outstanding</i>
Municipal	\$2,337.5	\$ 0.6	0.03%
Treasury	\$4,283.8	\$ 62.5	1.5%
Federal Agency	\$2,665.2	\$ 8.9	0.3%
Corporate	\$5,209.7	\$ 32.3	0.6%
Mortgage-Related ^a	\$6,400.4	\$ 98.2	n.a.

a. Percent cannot be calculated because outstanding includes CMOs and private-label MBS/CMOs; fails are for GNMA, FNMA, and FHLMC mortgage-backed securities only.

⁵⁹ “[A] ‘threshold security’ is defined in Rule 203(c)(6) as any equity security ... where, for five consecutive settlement days: there are aggregate fails to deliver at a registered clearing agency of 10,000 shares or more per security; that the level of fails is equal to at least one-half of one percent [0.5%] of the issuer’s total shares outstanding...”. Securities and Exchange Commission; Release No. 34-50103; File No. S7-23-03.

Estimation of costs to taxpayers and investors

Based on the data and our estimates, we can calculate some specific costs for uncollected federal and state taxes and for loss of use of funds to investors. These are direct costs. Economic damages may be significantly higher. See “For Further Research” at the end of this paper for our plan to expand research in this area.

Payment in lieu of municipal bond interest

We begin by using the 2007 fail rate of 5.4% for municipal bond trades calculated above. Of the \$26.2 billion of municipal bonds traded per day we know that 87.5% are customer (household investor) trades. That means that individual investors (i.e., taxpayers) trade about \$22.93 billion per year. Since 95.9% of traded value pays non-taxable interest, exempt from Federal taxes, that leaves \$21.985 billion. A 5.4% fail rate means \$1.187 billion of municipal bonds fail to be delivered to taxpayers every day. Assuming semi-annual interest payments, we are concerned about interest payments on \$2.374 billion.

The issuing municipality will only pay actual interest to investors who are owners, i.e., those who receive securities at settlement. Investors who are given “entitlements” to these securities therefore receive “payments in lieu” of interest. Broker-dealers do not differentiate these payments for tax reporting purposes so that investors take the tax exemption when this should be taxed as ordinary income.⁶⁰ At a 5% interest rate paid on municipal bonds (\$118.7 million) and a 35% marginal tax rate, the loss in federal tax revenue is \$41.6 million per year.

Payments in lieu of interest on US Treasury securities

Forty-three states have either income taxes or taxes on dividend and interest payments. The calculation for lost revenue to the states is similar to that for the federal government. Investors who receive payments in lieu of interest when their broker-dealer fails to receive purchased bonds will deduct those payments from their income. Because these payments are not actual interest income on Treasuries, investors should be paying ordinary income tax on them. Therefore, the state treasuries are collecting less tax than they should be. The lost state tax revenue is significantly smaller than the loss to the

⁶⁰ This is parallel to the dividend problem addressed by Section 6045(d) of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA).

federal government from taxes not collected on payments in lieu of interest on municipal bonds because Treasuries generally carry a lower interest rate and because state tax rates are lower than federal tax rates. The calculation is summarized in the table below. We estimate that the states are losing about \$271 million per year in tax revenue.

\$180,394,571,429	Fails to deliver in US Treasury securities
\$5,411,837,143	3% interest paid on US Treasury securities
\$270,591,857	5% average state tax rate
\$270,591,857	Annual lost revenue to states

Average state individual income tax rate calculated from data available from the Federation of Tax Administrators for tax year 2008. The fails to deliver are for April 2008 (updated from the earlier tables).

Investors' loss of use of funds

In the period between when the investor paid for the bonds and when the bonds are actually received, the investor could have used the money for other investments. The buyer's broker-dealer gains this time-value of the trade's cash over the fail interval by investing any end-of-day cash into investment vehicles such as overnight repurchase agreements that allow them to earn interest on idle cash balances. Individual investors do not share in this compensation. The value of the fails can vary wildly from day to day, but we believe this estimate needs to be more conservative than the tax consequences because we are assuming that the same value remains failed throughout the year. We use our overall failure to deliver figure for year end 2007 of \$251.9 billion to calculate the loss of use of funds to investors. We also use the federal funds rate, which is extremely conservative given the fact that this principal risk primarily comes from broker-dealers.⁶¹ Based on the mean 2.9% federal funds rate in the period of this study, the loss of use of funds to investors from settlement failures in US bond markets is \$7.3 billion per year.

CONCLUSIONS

This paper provides insight into the magnitude of the problem of settlement failures in US bond markets and the impact these failures to deliver have on investors and taxpayers. The rate at which bond trades fail to settle varies wildly throughout the year, across years

⁶¹ For example, on September 22, 2008 corporate bonds paid 450 basis points over Treasuries. Financial companies, under distress at this time, would have significantly higher costs of capital.

and across bond types. Efforts to date by several regulatory bodies have proven ineffective in containing the problem. Bond trades are failing at an increasing rate, resulting in larger values left undelivered after settlement payments are made. Based on conservative estimates for settlement failures in US bond markets, we estimate the direct cost to taxpayers and investors at over \$7.5 billion annually.

The bond market offers an opportunity to examine several possible explanations for settlement failures: problems with certificates (“back office operations”), a limited supply of securities available for lending, or fluctuations in interest rates (“strategic fails”). A negligible number of bonds use certificates and trade/settlement processing is virtually entirely automated. The US Treasury tried increasing both the supply of bonds and the amount available for lending without an immediate impact on settlement failures. Investment strategies that rely on failing to deliver securities for settlement are, at best, unacceptable business practices. Interest rates explain only a small part of settlement failures. We saw that fails to deliver in some bonds rise as interest rates are falling, contrary to results from earlier researchers. The cause of settlement failures in bond markets that has yet to be fully refuted is abusive market manipulation. We present some evidence in support of the moral hazard behavior of broker-dealers. The lack of severe penalties for settlement failures has, in our view, established the conditions for moral hazard behavior. If there are no consequences for failing to deliver securities then there is no incentive to complete deliveries for trades. As long as broker-dealers can satisfy themselves without bearing the full cost of failing to deliver securities at settlement, their behavior will come at the detriment of others. As long as regulators permit broker-dealers to continue to use the system to fail to deliver securities for settlement they will be encouraging that behavior in the future.

FOR FURTHER RESEARCH

The SEC suggested that the failure to deliver represents a futures contract, i.e., a derivative-type security for delivery of the bonds in the future.⁶² Futures, options and

⁶² “In effect the naked short seller unilaterally converts a securities contract (which should settle in three

other derivatives do not affect the fundamental attributes of the underlying security. As we discuss here, the return on investment on a bond can be affected by failures to deliver (tax consequences, use of funds, etc.). Failures to deliver also are known to drive down the price of the bonds. The economic status of claims and obligations between the owners and sellers of the underlying security as well as tax claims by government entities would not be affected by the trading of a derivative contract on the underlying.

We plan to continue tracking available data on this problem, as well as the problem of settlement failures in equity markets. We anticipate extending this analysis beyond estimation of the volume and value of fails toward determining the full economic damage done to all issuers of public securities in the US as well as investors and taxpayers. To this end, we plan to provide a separate, parallel analysis for equity securities (due to different data sources, market exchanges, regulatory entities, etc.). Back in 1968, before there was fully automated and centralized clearing and settlement, the SEC was discussing industry-wide problems of “failed to deliver” securities for settlement. At that time, they acknowledged that all the action taken to date was “emergency and short term.”⁶³ In 2008, the SEC is once again taking action that is “emergency” and “limited in duration.”⁶⁴ Between 1968 and 1969, fails to deliver by NYSE firms fell from 4.1 days of traded value to 2.9 days. Between 2007 and 2008, fails to deliver among NYSE firms *rose* from 0.31 days of traded value to 1.26 days.⁶⁵ After 40 years, immeasurable costs associated with automation and increased regulation, plus the creation of centralized clearing and settlement organizations, the value of settlement failures have increased six-fold from \$20 billion to \$119 billion (in constant dollars) and show no sign of decline.

days after the trade date) into an undated futures-type contract...” and “Short security futures, i.e., obligating a person to make a future delivery of the underlying securities, may function as a substitute for short selling the underlying stock.” Regulation SHO Proposal, Exchange Act Release 48,709, 68 Fed. Reg. 62,972, 62,975 n.31 (Nov. 6, 2003). Discussed further in Christian, Shapiro and Whalen (2006), “Naked Short Selling: How Exposed Are Investors?” *Houston Law Review* 43(4).

⁶³ SEC annual report to Congress, 1968 referring to Securities Exchange Act Release No. 8405 (September 13, 1968).

⁶⁴ *Ibid.* 3

⁶⁵ Fails to deliver were \$4.1 billion in 1968 and \$2.2 billion in 1969 compared to \$992 million and \$734 million in NYSE trades (per day). Fails figures are from year end reported in SEC annual report to Congress and NYSE value traded is from NYSE (nominal dollars). Fails to deliver reported by NYSE member firms balance sheets were \$39.3 billion in 2007 and \$118 billion in 2008. Figures are for first quarter. NYSE value traded was \$93.16 billion per day in March 2008 and \$93.42 billion in March 2007. Fails figures are from SIFMA and NYSE value traded is from NYSE (nominal dollars).

We remain intensely interested in quantifying the impact on the overall capital markets from the increase in the supply of securities available for trading associated with settlement failures. For example, in this paper we only calculated the direct costs to investors and taxpayers. Economic damages may be significantly higher. While an investor may receive payment in lieu of interest on municipal bonds when they are assigned a “fail to receive” at settlement, they are fully dependent on the financial condition of the broker-dealer to make that payment. The risk associated with broker-dealer operations is significantly different than the risk associated with investing in a municipality. Therefore, investors may be under-compensated for taking that risk in exchange for receiving payment only at the rate of interest paid by municipalities. In the period between when the investor paid for the bonds and when the bonds are actually received, the investor has principal risk. This is the risk that “the buyer of a security makes the payment but does not receive delivery of the security” (Devriese and Mitchell, 2006). Individual investors who receive entitlements in place of bonds should be compensated for this risk. Furthermore, each “fail to receive” represents an investor that wanted to invest in a corporation, municipality or the US government. Their purchase should have accrued as a benefit to the issuer. We will continue to investigate ways to measure these impacts.

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Chart A-1. Federal funds rate versus fails to deliver, weekly observations. Correlation coefficient is -0.4568, statistically significant at 1% level.

This chart demonstrates the erratic nature of available observations on trade settlement failures in bond markets, as well as the relatively low correlation with interest rates.

